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THE MEASUREMENT OF THE FACT BURDEN OF THREE GEOGRAPHY TEXTBOOKS FOR GRADES FIVE, SIX, AND SEVEN

Submitted by

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In partial fulfillment of requirements for
the degree of Master of Education

1947

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TABLE OF CONTENTS

CHAPTER PAGE

I. STATEMENT OF THE PROBLEM 1

II. RELATED RESEARCH 3

III. PROCEDURE 31

The Selection of Textbooks 31

The Selection of the Sampling 33

The Counting of Words 36

The Criteria for Judging Facts 37

The Counting of Facts 39

The Recording of the Data 41

The Analyzing of the Data 41

IV. ANALYSIS OF DATA 43

V. SUMMARY AND CONCLUSIONS 69

Suggestions for Further Study 72

BIBLIOGRAPHY 74

LIST OF TABLES

TABLE PAGE

I DISTRIBUTION OF STANDARD UNITS THROUGHOUT THE TEXTBOOKS 34

II NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE FIVE IN SERIES A 44

III NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE SIX IN SERIES A 45

IV NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE SEVEN IN SERIES A 46

V NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE FIVE IN SERIES B 47

VI NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE SIX IN SERIES B 48

VII NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE SEVEN IN SERIES B 49

VIII NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE FIVE IN SERIES C 50

IX NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE SIX IN SERIES C 51

X NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE SEVEN IN SERIES C 52

XI THE TOTAL AND AVERAGE NUMBER OF WORDS AND FACTS IN THE TEXTBOOK SAMPLES IN SERIES A . . . 53

TABLE PAGE

XII THE TOTAL AND AVERAGE NUMBER OF WORDS AND FACTS IN THE TEXTBOOK SAMPLES IN SERIES B . . . 53

XIII THE TOTAL AND AVERAGE NUMBER OF WORDS AND FACTS IN THE TEXTBOOK SAMPLES IN SERIES C . . . 54

XIV THE AVERAGE NUMBER OF WORDS AND FACTS IN THE TEXTBOOK SAMPLES FOR GRADE FIVE 54

XV THE AVERAGE NUMBER OF WORDS AND FACTS IN THE TEXTBOOK SAMPLES FOR GRADE SIX 55

XVI THE AVERAGE NUMBER OF WORDS AND FACTS IN THE TEXTBOOK SAMPLES FOR GRADE SEVEN 55

XVII COMPARISON OF FACT BURDEN OF TEXTBOOK A-5 WITH TEXTBOOK A-6 57

XVIII COMPARISON OF FACT BURDEN OF TEXTBOOK A-5 WITH TEXTBOOK A-7 58

XIX COMPARISON OF FACT BURDEN OF TEXTBOOK A-6 WITH TEXTBOOK A-7 59

XX COMPARISON OF FACT BURDEN OF TEXTBOOK B-5 WITH TEXTBOOK B-6 59

XXI COMPARISON OF FACT BURDEN OF TEXTBOOK B-5 WITH TEXTBOOK B-7 60

XXII COMPARISON OF FACT BURDEN OF TEXTBOOK B-6 WITH TEXTBOOK B-7 61

XXIII COMPARISON OF FACT BURDEN OF TEXTBOOK C-5 WITH TEXTBOOK C-6 61

XXIV COMPARISON OF FACT BURDEN OF TEXTBOOK C-5 WITH TEXTBOOK C-7 62

XXV COMPARISON OF FACT BURDEN OF TEXTBOOK C-6 WITH TEXTBOOK C-7 62

XXVI COMPARISON OF FACT BURDEN OF TEXTBOOK A-5 WITH TEXTBOOK B-5 63

TABLE		PAGE
XXVII	COMPARISON OF FACT BURDEN OF TEXTBOOK A-5 WITH TEXTBOOK C-5	63
XXVIII	COMPARISON OF FACT BURDEN OF TEXTBOOK B-5 WITH TEXTBOOK C-5	64
XXIX	COMPARISON OF FACT BURDEN OF TEXTBOOK A-6 WITH TEXTBOOK B-6	65
XXX	COMPARISON OF FACT BURDEN OF TEXTBOOK A-6 WITH TEXTBOOK C-6	65
XXXI	COMPARISON OF FACT BURDEN OF TEXTBOOK B-6 WITH TEXTBOOK C-6	66
XXXII	COMPARISON OF FACT BURDEN OF TEXTBOOK A-7 WITH TEXTBOOK B-7	66
XXXIII	COMPARISON OF FACT BURDEN OF TEXTBOOK A-7 WITH TEXTBOOK C-7	67
XXXIV	COMPARISON OF FACT BURDEN OF TEXTBOOK B-7 WITH TEXTBOOK C-7	68

CHAPTER I

STATEMENT OF THE PROBLEM

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STATEMENT OF THE PROBLEM

The purpose of this study was to measure the fact burden of certain geography textbooks in order to determine (1) if there is any characteristic difference of fact burden between texts for different grades in the same series, and (2) if there is any characteristic fact burden for any grade level. Three series of textbooks commonly used in grades five, six, and seven or eight were sampled for their fact content.

Up to the present time most of the research on the readability of textbooks has dealt with vocabulary burden and the mechanics of expression used in presenting the content material. Vocabulary studies have counted the number of running words, determined the word diversity, the number or percentage of uncommon or technical words, the number or percentage of polysyllabic words, the relation of personal pronouns to the total number of words in the text. A sampling of words has been checked with one or more indexes of word difficulty. Other studies have analyzed the structural elements: the number of simple sentences, the average sentence length in words and syllables, the number of phrases. Still others have investigated the effect of the style in which the

material is written upon the readability of the content material.

The comprehension factor appears, however, to be too complex to be regarded as largely a function of word usage, sentence structure, or style. Checking a given textbook against these factors does not automatically guarantee the fitness of that book for use in a given grade. Because many have complained that geography textbooks in general are veritable encyclopedias with facts following one another in rapid sequence without elaboration or explanation, it would seem that possibly the multiplicity of facts in geography textbooks might be a factor affecting the readability of these books. This study was therefore initiated in order to determine the extent of the constancy or variablity of the quantity of facts, or fact burden, among books for the same grade in different series and books for different grades in the same series.

CHAPTER II

RELATED RESEARCH

CHAPTER II

RELATED RESEARCH

The consideration of the vocabulary of a textbook as a factor affecting its readability has been the purpose of an abundant number of investigations into the vocabulary burden of the textbooks in many fields of subject matter. It seemed advisable to include in this study only the more significant studies of vocabulary burden in general and of the vocabulary burden of geography textbooks in particular. Lively and Pressey[1] investigated the vocabulary of sixteen types of reading materials ranging from a second grade reader to a textbook in college physics. The range of vocabulary, or number of different words occurring in a one thousand word sampling, was tabulated for each type of material and the weighted median index of this sampling was calculated. This was done by first finding the index number of each word in Thorndike's Teacher's Word Book of 20,000 Words. Words not included on this list were assigned a zero value and were counted twice. In comparing the books with each other, it appeared that the higher the median index number the easier the vocabulary.

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[1] B. A. Lively and S. L. Pressey, "A Method for Measuring 'Vocabulary Burden' of Textbooks," Educational Administration and Supervision, IX (October,1923), 389-98.

Dolch[1] objected to the use of Thorndike's Word Book as an index of word difficulty in judging the difficulty of textbooks for children due to the fact that classic literature for adults formed a large part of Thorndike's sources and also because this list assumes that frequency and difficulty correlate very closely. In his vocabulary studies, Dolch compared the words sampled with The Combined Word Study List. This list is a combination of fifteen word studies including: studies based on children's speech or writing; studies based on adults' letters; studies based on reading matter. It also indicates to what school grade each word belongs. The relative difficulty of the vocabulary of the text was then calculated by finding the relation between the number of different words for each grade level and the total number of running words. Dolch did not believe, however, that the result of this method should be the only criterion in determining the vocabulary burden of textbooks. Differences in the frequency and spacing of the repetition of words were also taken into consideration in his study, as well as the degree of difficulty of words--some being one grade too hard and others many grades.

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[1] Edward W. Dolch, "Vocabulary Burden," Journal of Educational Research, XVII (March, 1928), 170-183.

The importance he gives to the consideration of vocabulary as a factor of readability is evident by his statement ". . . vocabulary difficulty may cripple understanding and destroy interest."[1]

Pressey[2], in a study of vocabularies of widely used textbooks, found that the geographies examined contained 1132 words which were technical or unusual and which would not frequently be met, if at all, outside of geography textbooks. Each text was read by at least two readers. They copied the words they felt the students would find difficult. All books were read and re-read until no new words were added to the list. Teachers of geography were then asked to check the words in order that an "essential" vocabulary and an "accessory" vocabulary could be found. Of the 1132 words, 313 were checked as "essential", 690 were classed as "accessory", and 129 were not thought necessary by the teachers consulted. Geography texts contained the highest percentage of words in the last category. For the basis of comparison with the other school subjects of the grades within the range of this study, the results were tabulated as follows: in

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[1] Ibid., p.170.

[2] Luella C. Pressey, "The Determination of the Technical Vocabulary of the School Subjects," School and Society, XX (July 19, 1924), 91-96.

arithmetic of a total of 406 different words, 83 were considered "essential", 274 "accessory", and 49 not necessary; of history's 1045 words, 542 were "essential", 503 "accessory", and 0 not necessary; of 836 in literature, 306 were "essential", 509 "accessory", and 21 not necessary; of 1564 in general science, 916 were "essential", 648 "accessory", and 0 not necessary. Pressey did not use the results of her study as a measure in determining the relative difficulty of vocabulary in various textbooks, but she suggested that the vocabulary burden of a particular text might be rated by finding what proportion of the words of the list appear in one text as compared with another.

Johnson's[1] method of determining the measure of difficulty of reading matter, which he claimed was simple to administer and at the same time reliable, was to find the per cent of polysyllabic words in a random sampling of three thousand words. In an experiment, he tested two equated groups of 123 students. Each read an eight hundred word selection of the same content, one selection containing as many monosyllabic words as possible, the other many synonymous polysyllabic words. The results of a test given on these

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[1] George R. Johnson, "An Objective Method of Determining Reading Ability,"Journal of Educational Research, XXI (April, 1930), 283-87.

selections showed that the monosyllabic selection was strikingly less difficult than the polysyllabic selection. In an extensive study, Johnson also noted that the percentage of polysyllabic words in the first five groups of five hundred words in Thorndike's Word Book increased with every list; polysyllabic words in reading tests increased with the increase in grade level; books written for consecutive words showed an increase in the number of polysyllabic words; increase in polysyllabic words increased correspondingly to the increase in technical words based on the Pressey Technical Word List; books on graded supplementary reading lists showed an increase in polysyllabic words from grade to grade. As a result of this study, Johnson concluded that the per cent of polysyllabic words is a measure of the difficulty which children will have in reading a book.

Using a formula suggested by Yoakum, Ramsey[1] determined the reading difficulty of a fifth grade geography textbook. The index of average difficulty was found by dividing the sum of the index numbers for words in the selection, as indicated in Thorndike's Word Book, by the number of units of one hundred words. By lightening the vocabulary load of certain

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[1] Gertrude May Ramsey, "An Experimental Study of Reading Difficulty in Geography," (unpublished Master's thesis, University of Pittsburgh, Pittsburgh, 1939).

selections, she was able to lower the index of reading difficulty which, in turn, was reflected in better pupil comprehension of the geographic material.

Shaffer's[1] investigation, in which the words in three textbooks in world geography were tabulated and compared with Thorndike, found that there were a relatively large number of difficult words of low frequency; (2) a small number of words of high frequency; (3) a high ratio of words that are special or class words; (4) a high ratio of words not found in Thorndike's Word Book or if there, are located in the second half of the list; (5) great differences among the central tendencies of the three texts. Shaffer concluded that the study of geography requires the mastery of an exceptionally large number of words which are new and unfamiliar to the pupil. Because of this large quantity, the pupil does not master them.

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[1] Lewis Gains Shaffer, "The Derivation and Analysis of a Vocabulary in World Geography" (unpublished Master's thesis, University of Pittsburgh, 1930), reviewed by Norah E. Zink, "Eighty-two Studies in the Teaching of Geography Classified by Content and Technique with Selected Summaries," Thirty-Second Yearbook of the National Society for the Study of Education (Bloomington, Illinois: Public School Publishing Company, 1933), p.457.

There seems to be an agreement among investigators that no one factor taken alone is sufficiently reliable in determining reading difficulty. Vogel and Washburne[1] worked out a formula which they found satisfactory for the grade placement of books by combining in certain proportions the following elements as found in a one thousand word sampling: (1) the number of different words; (2) the number of uncommon words as determined by the Thorndike _Word_ _Book_; (3) the number of prepositions; (4) the number of simple sentences in a sample of seventy-five sentences. From the formula devised in this study, Vogel and Washburne felt that it was possible to determine the correct grade placement for any book so far as structural difficulty was concerned. Later Washburne and Morphett[2] broadened the scope of their investigation and a

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[1] Mabel Vogel and Carleton Washburne, "An Objective Method of Determining Grade Placement of Children's Reading Material," _Elementary_ _School_ _Journal_ XXVIII (January,1928) 373-81.

[2] Carleton Washburne and Mabel Vogel Morphett, "Grade Placement of Children's Books," _Elementary_ _School_ _Journal_, XXXVIII (January, 1938), 355-64.

graded list was derived by taking the median reading grade of the children who liked each book as the grade to which the book belonged.

In a detailed analysis of five widely used geography textbooks, Evans[1] tabulated the mechanical aspects of expression and presentation: the average number of words found difficult by the pupils; the range of vocabulary according to the number of different words contained in his samplings; the per cent of monosyllabic words; the weighted median index number of vocabulary according to Thorndike's Word Book; the average word length of sentences; the per cent of simple sentences; the number of different phrases. He then determined the rank of each textbook in each factor and the rank for all combined factors. As another phase of the study, a small group of pupils were asked to read orally selections in the various textbooks being analyzed. The results were then tabulated and the textbooks were ranked in order according to the number of words read per minute by the pupils; the number of words read per each error made; the per cent of questions answered correctly. By totalling the rank order of each book in each factor, a composite rank order was determined which was considered to be the index of reading

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[1] Richard Evans, "A Comparative Analysis of Five Geography Textbooks with Respect to Readability,"(Unpublished Master of Art's thesis, School of Education, University of Michigan, Ann Arbor, 1939).

difficulty, the top ranking book being the least difficult. The latter was then correlated with the rank order of the textbooks with respect to the mechanical aspects of expression and presentation. A close relationship appeared to exist between the rating of reading difficulty through an analysis of the rate, accuracy, and comprehension with which pupils read, and the rating according to the mechanical features of the manner in which the textbook was written. There was a coefficient of correlation of .70. In correlating the mechanics of expression with each factor of readability, the rate of reading appeared to be the most reliable index of readability. In finding the correlation between readability and each mechanical aspect, the best single criterion appeared to be the frequency with which difficult words were used. On the whole word analysis seemed to be a more reliable means of measuring reading difficulty than was structural analysis. The proportion of simple sentences seemed to give some indication of the reading difficulty of the book. The frequency of phrases, however, appeared to be a very doubtful criterion in determining reading difficulty.

Lorge[1], in predicting the difficulty of reading

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[1] Irving Lorge, "Predicting Reading Difficulty of Selections for Children," The Elementary English Review, XIV (October, 1939), 229-33.

passages as a function of the internal structure of a reading passage, figured the correlation for different combinations of elements. Among the elements considered were: the number of running words; the number or percentage of different words; the number or percentage of uncommon or difficult words; the number or percentage of polysyllabic words; the number of prepositions; the number of simple sentences; the average sentence length in words or syllables; and the number of ideas per hundred words. As a result of this study, he found that after the vocabulary elements were in the prediction other structural elements added insignificant increment to the prediction. He states," . . . the most significant indicator or predictor of passage difficulty will be some function of the vocabulary used."[1] An indication that Lorge felt that research may uncover other predicting factors is his statement, " . . . the criterion for comprehension has not yet been defined with sufficient rigor."[2]

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[1] Ibid., p.229.

[2] Loc. cit.

The effect of the style of material upon readability has been the object of several experimental investigations. McKee[1] used 608 children in grades four through eight as his experimental group. Pupils were placed in two paired groups according to reading ability as measured by the Thorndike Reading Scale, group A reading the "fact" form of the material and group B the "story" form. Using different material, group A then read the "story" form and group B the "fact" form. In fourteen comparisons of the relative efficiency of comprehension of both sections, in only three instances was the mean of the "story" section superior to the mean of the "fact" section and in only one instance was the difference significant. In eleven comparisons, the mean of the "fact" section was superior and in eight instances the difference was significant. McKee[2] says:

> Results show clearly that, as used in this investigation, the 'fact' form of presenting information insures more efficient comprehension and retention of the information involved than does the 'story' form of presentation. It seems reasonable therefore to say that _for purposes of enhancing comprehension and retention of information by pupils it is better to present that information in 'fact' form than to attempt to make it attractive by using the story element as a vehicle_. [italics in the original]

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[1] Paul McKee, "'Fact' Form and 'Story' Form Reading Matter," _The Elementary English Review_, III (January, 1926), 3-8.

[2] _Ibid._, p.8.

Another factor considered by McKee, but not statistically determined, was the question of reading time. In his investigation there was no time limit for the reading of the selections, however, he states:

> Because the 'story' form of the material was at least twice as long as the 'fact' form one may reasonably assume the average time required for reading the 'story' form to have been considerably longer than that required for the reading of the 'fact' form. If a record has been kept of the time required by each pupil to complete his work, one could possibly have shown that the 'story' group required more time to get less information than the 'fact' group.[1]

To determine which style of material was more effective in the teaching of geography factual material, Garnett[2] conducted an experiment under the direction of Dr. Ernest Horn in the University Elementary School at The State University of Iowa.

> By Story-factual material is meant that type of reading matter that has as its purpose the presentation of facts, but which interweaves those facts with a story. . . The other type of material, the factual, offers no apology for presenting facts but presents them in a straight forward manner.[3]

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[1] Ibid., p.8

[2] Wilma L. Garnett, "Factual Versus Story-Factual Material," The Elementary English Review, III (October,1926), 268-71.

[3] Ibid., p.268.

The procedure used was similar to McKee's as to materials. Eighty-four cases in grades three through six were divided into two equally intelligent groups according to intelligence quotient on the Stanford Intelligence Tests. Pupils were given a fifteen minute time limit to read the geographical material and take the comprehension check test. In interpreting the results, Garnett found that the results seemed to indicate that neither type of material was more efficacious. The efficacy of the material appeared to vary with the individual, some deriving better results from the story-factual material and others from the factual material. Because of the greater length, the story-factual material of necessity required a greater length of reading time. The pupils were then asked to tell which material they liked better. The weight of preference was slightly in favor of the story-factual. Garnett felt, however, that the preference data was not entirely free from a variable due to the fact that in expressing a preference for the material, the pupil might have been expressing instead a liking for the subject matter of the content. In conclusion,Garnett[1] states:

> The reasons for liking are more meaningful on the _factual_ side. These reasons are given by the children who are the best thinkers in the groups. Perhaps in this fact is one of the most pertinent indications. The children who are the most earnest and are most studious prefer the factual to the story-factual material.

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[1] _Ibid_., p.271

The purpose of a study by Mandeville[1] was to collect and interpret objective data concerning the comparative interest which children display in (1) readings that merely describe human activities, and (2) readings that not only describe such activities but also give some explanation to them. Twenty pairs of such readings were prepared, each pair consisting of two brief paragraphs. Questions were then devised to discover which of each pair of paragraphs was preferred and why. The readings and questions were presented to 2340 children in grades four through nine. The results of the experiment pointed out that 83.8 per cent of all reactions were in favor of readings presenting relations; that 60.8 per cent of these children were conscious of the fact that it was the explanatory element in these readings that appealed to them because they checked the reason, "It tells why"; that 29.8 per cent of the pupils who chose the fact reading expressed a dislike for the explanatory element contained in the relations material.

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[1] Dorothy A. Mandeville, "Children's Interest in Two Types of Reading Material Used in Geography," (unpublished Master's thesis, University of Chicago, 1930) reviewed by Norah E. Zink, "Eighty-two Studies in the Teaching of Geography Classified by Content and Technique with Selected Summaries, Thirty-second Yearbook of the National Society for the Study of Education, (Bloomington, Illinois: Public School Publishing Company, 1933), pp. 470-71.

Engleman[1] also prepared two versions of the same factual content material to determine the preference of pupils for the materials, and to ascertain the success with which pupils read this material as measured by their comprehension, relative word rate, and retention of content. The two versions, one conversational and the other narrative-expository in form, were given to pupils in grades four and seven. In these grades, preference was demonstrated for the conversational style as follows:

Fourth grade boys -- 63.5 per cent
Fourth grade girls -- 75.2 per cent
Seventh grade boys -- 54.8 per cent
Seventh grade girls -- 83.4 per cent

With regard to the efficacy with which the material was read, comprehended, and retained, in the case of the fourth grade comprehension only did the narrative-expository material rate better than the conversational style and then the difference was not statistically significant. However, in spite of the fact that the conversational style outranked the other in most instances, only in the case of the fourth grade relative word rate was the difference significant.

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[1] F. E. Engleman, "The Relative Merits of Two Forms of Discourse When Applied to Children's Factual Content Materials," Journal of Educational Research, XXIX (March,1936), 524-30.

Engleman[1] states:

> The findings of this study would seem to warrant the conclusion that factual content written in a conversational style deserves greater recognition by public school officials. Since children have demonstrated a preference for this style and are not handicapped by it in comprehension, rate of reading, or in retention of facts learned from reading, there probably is justification for claiming for it a larger place in children's content reading.

Kyte[2] undertook a series of investigations to determine the interest appeals of children in content reading material. Selections from geography texts were used to determine what types of subject matter appealed to pupils and what types of presentation of the material interested them. He found that pupils preferred accounts that were developed in considerable detail and that they were attracted by presentations in which careful attention was given to the explanation included. The reactions of the pupils clearly indicated that their interests were vastly different from those which adults have guessed them to be.

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[1] Ibid., p.530

[2] G. C. Kyte, "Experimentation in the Development of a Book to Meet Educational Needs," Educational and Supervision XIV, (February, 1928), 86-100.

Many studies have been undertaken to determine what facts should be included and emphasized in geography textbooks. An early inquiry was launched by Whitbeck.[1] He attempted to prepare a list of locational facts to be thoroughly taught and permanently learned in the field of geography. Some seventy-five teachers, principals, and superintendents from twenty or more states and representing all types of schools, collaborated in preparing this list. This list was then referred for approval to a committee of five members of the geography faculty representing various universities and colleges. Two-thirds of the cities listed by the first committee failed to gain the approval of the faculty committee. A significant conclusion to be drawn from this study is that only a relatively small number of place location facts out of a rather large total list found in geographies were endorsed by even specialists in geography. Whitbeck found 114 different facts given about Belgium in a grammar school geography textbook. Among one hundred well-educated people not ten could tell off-hand a quarter of these 114 facts. Whitbeck felt that nearly every one of the facts was of general interest and worthy of a place in a school geography but that not over one-eighth of

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[1] R. H. Whitbeck, "Where Shall We Lay Emphasis in Teaching Geography?" Education, XXXI (September,1910),108-16.

them deserve to be drilled or reviewed. " . . . let [ing] the one hundred interesting but incidental facts drift away into the inner chambers of the pupil's memory,"[1] says the author. In discriminating between geographical facts that are fundamental and those that are only incidental, Whitbeck suggests:

> . . . the teachers shall select a few points in connection with a country or region, points that her judgment tells her are consequential, and then emphasize those so they will stick. The number of such facts is after all relatively small. But these facts ought to stand out in teaching like headlines in a newspaper.[2]

In referring to freshmen studying physical geography in a university, Whitbeck wondered if their lack of knowledge was not in part the result of an attempt to teach too many facts, the location of too many places, and the names of too many rivers. "The most inevitable tendency is to teach too many things and discriminate too little between big things and little,"[3] he said. "We ought to lay emphasis upon those facts which are likely to prove most useful to the average man and woman."[4]

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[1] *Ibid*., p. 112.

[2] *Ibid*., p. 111.

[3] *Ibid*., p. 112.

[4] *Ibid*., p. 108.

A student of Bagley's[1] collected and classified the geographical and historical references and allusions in eighteen issues of the Outlook and Literary Digest representing a period of seven years ending with 1913. She found a total of 2,237 geographical references distributed as follows: references to facts of location, size, direction, etc. which may be assumed to require for their understanding a knowledge of "place and location geography", 53.5 per cent; references to political divisions which may be assumed to require a knowledge of "political geography", 25.1 per cent; references to industries, commerce, products, etc. which may be assumed to require a knowledge of "commercial geography", 5.8 per cent; references to customs, religion, education, etc. which may be assumed to require a knowledge of "social geography", 4.8 per cent; references to places as scenes of historical events, 1.7 per cent; other references primarily of local or transitory interest 8.9 per cent. From the results of this investigation the information was tabulated to show the relative emphasis alloted to continents; European countries; cities; rivers, seas, gulfs, and straits; names of famous people, etc.

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[1] W. C. Bagley, "The Determination of Minimum Essentials in Elementary Geography and History," Fourteenth Yearbook of The National Society for the Study of Education, (B loomington, Illinois: Public School Publishing Company, 1915) 131-46.

Duboc,[1] working with a Committee on Research in Geography prepared a questionnaire concerning teaching procedures, available supplementary geographical readers and other equipment, and characteristics of a geography textbook. This was sent to 527 teachers of Montana rural graded schools and ninety-two administrators of Idaho, Washington, and Oregon. As a result of this investigation, the committee concluded:

> A textbook for children should be more than a compilation of facts, however important those facts may be. It should lead children in their independent reading of it to understand the relationship of man's activities to his geographical environment.[2]

Another conclusion was:

> . . . there has not been sufficient attention given to the reading problems in children's learning of geography. . . These reading problems are not concerned chiefly with vocabulary difficulties. The character of the content, its presentation, the assistance which it gives to the study and utilization of pictures and maps, the stimulus which it offers to curiosity and desire to search for more information, and the possibilities of gaining from the independent reading an understanding of the relationships between what people do and their geographical environment--all these are important factors in children's successful reading of geographical material. The usual geography textbook does not sufficiently take these factors into account.[3]

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[1] Jessie L. Duboc, "What Should a Geography Textbook Contain?" Journal of Geography, XXVIII (October,1929),286-91.

[2] Ibid., p. 290.

[3] Loc. cit.

Parker[1] analyzed twenty statements about Hawaii in a geography text to discover what types of idea were included and what types of learning experience were afforded by them. An analysis was also made of five hundred unsolicited testimonials of individuals to determine the types of ideas they had found through experience to be of value in their activities. Two individuals had found helpful descriptive encyclopedic facts about man and nature; fourteen of the 20 statements about Hawaii were classified by Parker in this category. Thirty-three mentioned the relationship between nature elements; only 1 statement about Hawaii referred to this relationship. Nineteen found relationships between human elements helpful; there was a question as to whether even 1 of the statements about Hawaii pointed out this relationship. Three hundred fifty-seven had had occasion to refer to relationships between human and nature elements; only 1 statement in the text called attention to this relationship. Forty-four found useful interpretive ideas of a large scale order; there were 5 statements that, according to Parker, fell in this class and a question of 2 others. Forty-five testimonials related the usefulness of map symbolism of ideas which of course could not be compared

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[1] Edith Putnam Parker, "Investigating the Value of Geographic Offerings," Thirty-second Yearbook of the National Society for the Study of Education, (Bloomington, Illinois: Publishing School Publishing Company,1933), 73-91.

with the statements from the text. In summarizing the results of her analyses, Parker[1] says:

> . . . that in so far as the material presented is a mere mass of encyclopedic facts, its value is negligible, and the ideas and learning experiences involved has little or no claim for recognition in a curriculum designed for general education, but that, in so far as the material presented is such as to give the learners ideas of an interpretive type, ability to gain such ideas for themselves, and power to use them effectively in practical situations, geography can make very valuable contributions to child-training.

In an investigation using four reading selections from textbooks in American history, Dewey[2] prepared tests to determine (1) whether pupils were able to secure facts from the reading material and (2) whether the pupils were able to do inferential thinking concerning the material read. By inferential thinking he meant, "the ability to evaluate, to read between the lines, and then understand the significance of what is read."[3] In tabulating the results of the tests he found that the two phases of reading under investigation correlated as follows: Selection A .382 ± .075; B .435 ± .061; C .650 ± .051; D .652 ± .045. The results appeared to

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[1] *Ibid*., p.91.

[2] Joseph C. Dewey, "The Acquisition of Facts as a Measure of Reading Comprehension, " *Elementary School Journal*, XXXV (January,1935), 346-48.

[3] *Ibid*., p.346.

indicate that it is an error to interpret the results of factual reading tests as an indication also of the ability of children to think about and to understand what they had read. Dewey[1] states:

> The reason for the difference between the ability to secure facts and the ability to do inferential thinking may be either that the pupils secure the facts and then do not know how to use them, or that the pupils' apparent grasp of facts is only verbalism, that they really do not understand what they glibly express in words in the written test.

Using as a criterion that the "difficulty of an item is generally determined in terms of the number of persons in some groups which is able successfully to respond to the item in question,"[2] McClusky selected passages from six different types of material and presented these to pupils to determine the level of difficulty. The pupils, most of whom were sophomores and juniors at the University of Michigan, read at a normal rate and then answered true and false comprehension exercises from memory. Rate or reading scores were utilized in determining the level of difficulty because they were more convenient statistically and because they represented both the speed of reading and the speed developed in response to a demand for comprehension for that type of

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[1] *Ibid.*, p.348

[2] Howard Y. McClusky, "A Quantitative Analysis of the Difficulty of Reading Materials," *Journal of Educational Research*, XXVIII (December,1934), 276.

reading. McClusky found that there were three distinct levels of difficulty; fiction was the easiest, then sociology and political science; and last psychology and physics. To find out why some of the selections were easier to read than others, the selections were analyzed to discover the number of ideas, the length of words, the length of sentences, and the types of nouns. In investigating the number of ideas, Gray's[1] method of dividing the various passages into ideas was used; : "Tiny Tad was a queer little fellow/ with only two legs / and a short tail." A sample sentence from McClusky's study was divided as follows: "Europeans often ask / how it happens that the Presidency of the United States / is not more frequently filled / by great and striking men."[2] The results of this phase of the analysis indicated no appreciable variation in number of ideas per hundred words for the various passages. However, the efficacy of the technique used in counting the number of ideas is demonstrated by the result of an experiment conducted by McClusky. Because he felt that there was likely to be a considerable amount of subjectivity in the type of analysis

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[1] W. S. Gray, "Studies of Elementary School Reading Through Standardized Tests," Supplementary Educational Monograph, Vol. I, No. 1 (Chicago Department of Education, University of Chicago, 1917), 108.

[2] McClusky, op. cit., p.278

he was undertaking, and in order to reduce this element as much as possible, he used the method with various types of reading material but with passages not included in the main part of the investigation. He analyzed each of the six passages twice to check one against the other and converted them into figures showing the number of ideas per one hundred running words.

TABLE II[1]

The Number of Ideas per Hundred Words in Each of Six Experimental Selections

	Types of Passages					
	Fiction	Political Science	Economics	Sociology	Psychology	Physiology
First count	19	21	22	22	20	20
Second count	20	19	21	20	19	20

As a result of all the analyses made in the study, the qualities of the easy material, as characterized by fiction, included short, simple sentence structure and easy, familiar vocabulary. The difficult material, as characterized by psychology and physics, on the other hand, used technical, unfamiliar vocabulary, complex sentence structure, and even though the ideas were no greater in number "They are more technical, abstract, and generalized in character,"[2]

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[1] *Ibid.*, p.279

[2] *Ibid.*, p.281

according to McClusky.

How to find the number of facts that need to be learned in geography is a difficult problem according to Reed.[1] Assuming that every topic in the index of a textbook refers to at least one fact; that each page reference in the index refers to at least one important fact; that each paragraph or each review question refers to at least one important fact; or that the true number of facts lies somewhere between the measure giving us the lowest number of facts and on the one giving us the highest number, Reed analyzed three two-volume texts that were widely used before 1927 with the following results:

	Vol. I	Vol. II
Number of review questions	655-1124	704-1451
Number of paragraphs	1080-1300	1560-1836
Number of topics in index	1069-1646	1288-1876
Number of page references	1475-5422	3451-8916

Reed says:

> Topics in the index, as well as the text paragraphs, generally represent groups of facts rather than single facts, while the page references more often refer to single facts. Upon these bases we may say that the number of facts contained in a geography varies between the number of text paragraphs as a minimum and

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[1] Homer B. Reed, Psychology of Elementary School Subjects,(Boston: Ginn and Company, 1938) 456-7.

> the number of page references in the index as a maximum. Whichever basis we take, we can see that the number of facts is very large. This alone creates a great difficulty in learning.[1]

Realizing that the problem of the readability of a textbook involves more than the vocabulary level of the book, and mode of expression, Dolch[2] undertook an exploratory study of the fact burden of certain textbooks as a possible criterion to be considered in predicting the readability of textbooks. In a report of this study, Dolch[3] states:

> We have all spoken of textbooks as being 'heavy' and others as being 'light'. By this phrase we have generally meant that some textbooks are more loaded with facts than others. Students of all grade levels have complained that their textbooks are too heavy with facts. They have complained that there is too much for them to remember. Teachers have complained that there is too much for them to teach.

Dolch analyzed five sixth grade geography books and found that the number of facts varied from 24.3 facts per page to 48.9 facts per page. He used six hundred running words as the standard unit for a page and sampled the equivalent of ten full pages. An analysis of a history series with books

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[1] Ibid., p.457.

[2] Edward W. Dolch, "Fact Burden and Reading Difficulty," The Elementary English Review, XVI (April,1939), 135-8.

[3] Ibid., p.135.

written for grades five through eight indicated that there were from 10 to 13 facts per page of three hundred words; in a science series used in grades two through six, there were from 3.3 to 6.5 facts in from one hundred twenty-five to two hundred fifty running words; and in health books for grades one and two, there were 1.5 facts per page of one hundred running words. Dolch observed that books with a low average fact burden were uneven when the individual pages were taken into consideration. Even the geography which averaged 48.9 facts per page had 74 facts on one of the sampled pages. He felt, therefore, that although the average for a book was useful in comparing it with other books, it did not give a true picture of the book itself. It was noted that the geography textbooks were practically straight description and explanation and that as the books became lighter in fact burden they became more and more to be story type material. Dolch states:

> We cannot say just what fact burden is characteristic of any grade level because very extensive figures would be needed for such a conclusion. Neither can we say what should be the fact burden in any one grade. Wide experimental study with materials of different fact burden will be required to get at this situation.[1]

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[1] Ibid., p. 136

CHAPTER III

PROCEDURE

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The Selection of Textbooks. In selecting the textbooks to be analyzed for the fact burden in this study, there were two main considerations. It was felt, by the writer, that the textbooks should be those known to be commonly accepted and used. Therefore, the textbooks selected included those in the geography series adopted in the school system in which the writer teaches, and those in the geography series used in the communities near-by. The names of these series were obtained as a result of an informal inquiry of several administrators and teachers. It seemed also essential that the textbooks should be part of a series in which books were available for grades five, six, and at least one grade beyond grade six. Due to differences in the social studies curriculum beyond grade six in various school systems, some of the books are designated by the publisher for grade seven or grade eight.

An attempt was also made to select books with the most recent copyright date possible. The books used in this study were obtained directly from the publisher and were the most recently published books available at this time from those publishers. The Silver Burdett series is in the process

of revision and the book for grade five is the only book of the series which has been completed to date. In the case of the book for grade seven in the Rand & McNally series there has been a 1945 copyright date, but it is out of print at the present writing.

On the basis of the above considerations, the following textbooks were selected:

Series A

Book 5. Atwood, Wallace W. and Thomas, Helen Goss, The American Nations. Boston: Ginn and Company, 1946. 388 pp.

Book 6. Atwood, Wallace W. and Thomas, Helen Goss, Nations Overseas. Boston: Ginn and Company, 1946. 392 pp.

Book 7. Atwood, Wallace W. and Thomas, Helen Goss, The Growth of Nations. Boston: Ginn and Company, 1947. 388 pp.

Series B

Book 5. Barrows, Harlan H., Parker, Edith Putnam, and Sorenson, Clarence Woodrow, The American Continents. New York: Silver Burdett Company, 1946. 314 pp.

Book 6. Barrows, Harlan H., Parker, Edith Putnam, and Parker, Margaret Terrell, Europe and Asia. New York: Silver Burdett Company, 1941. 280 pp.

Book 7. Barrows, Harlan H., Parker, Edith Putnam, and Parker, Margaret Terrell, Southern Lands. New York: Silver Burdett Company, 1941. 296 pp.

Series C

Book 5. McConnell, W. R., Geography of the Americas. New York: Rand McNally & Company, 1946. 410 pp.

Book 6. McConnell, W. R., Geography of Lands Overseas. New York: Rand McNally & Company, 1946. 392 pp.

Book 7. McConnell, W. R., The United States in the Modern World. New York: Rand McNally & Company, 1939. 305 pp.

In the remainder of this study, each textbook is referred to by letter and number, as designated above, according to the series to which the book belongs and the grade for which it is recommended by the publisher. The American Nations will thus be referred to as A-5.

The Selection of the Sampling. The sampling within each book, in this study, was determined by using a method similar to that employed by Dolch[1] in his exploratory study. Because geographies are illustrated so profusely, Dolch found it necessary to adopt some standard unit for the purpose of comparison. In the geography textbooks used in his investigation, he discovered that full-type pages, on which there were no illustrations or study exercises, contained an average of six hundred words. He therefore used six hundred running words as a standard unit of a page. His sampling

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[1] Edward W. Dolch, "Fact Burden and Reading Difficulty," The Elementary English Review, XVI (April,1939),135-8.

consisted of ten units of six hundred words which was the equivalent of ten full pages of the text. In this study, the sampling for each text consists of ten units of six hundred words.

In determining the ten standard units to be analyzed, the writer first ascertained the total number of pages in the text from the first page of the content material to the last page of the content material which preceded the appendix, index, review questions or exercises, or supplementary material. It could then be determined on what page the beginning of each standard unit would fall in order to be spaced evenly throughout the book.

TABLE I

DISTRIBUTION OF STANDARD UNITS THROUGHOUT THE TEXTBOOKS

Textbook	Number of Pages of Content Material	Frequency of Sampling
A-5	375	Every 37th page
A-6	378	Every 37th page
A-7	372	Every 37th page
B-5	307	Every 30th page
B-6	263	Every 26th page
B-7	287	Every 28th page
C-5	378	Every 37th page
C-6	356	Every 35th page
C-7	270	Every 27th page

In instances where the page to be sampled coincided with a full-page map, an entire page of workshop suggestions, or study exercises, either the next following page of content material or the next preceding page of content material was used as the sampled page, depending upon whichever content material was nearest to the original page to be sampled.

In counting the words on the sampled page to determine the limits of the standard unit, the writer began with the first word in the first whole paragraph on that page and ended with the end of the sentence or the end of the complete thought which came closest in number of words to the six hundred words which was to be the size of the sample. Thus it resulted in some samples containing 604 words and others 596, to cite two examples. In averaging the total number of words on the sampled pages for each textbook, an average of six hundred words was closely approached.

In cases where it was necessary to take as a sampled page one which preceded the page on which the sample originally fell, the writer started the count with the last word in the last complete sentence on the page to be sampled, and counted back to the place where a unit would end as described above.

The Counting of Words. All words in the content material in the unit were counted with the exception of words in parentheses, and those words in italics which referred to a page or figure, such as: See figure 29. Headings for sections of the text were counted whether they were in heavy print at the beginning of a paragraph or in a separate line. A hyphenated word was counted as one word if it was listed as such in the dictionary, e.g.: "Near-by". If not listed as hyphenated in the dictionary, it was counted as two words, e.g.; "hand-plaited." Words hyphenated due to syllabication when separated at the end of a line were counted as one word. Each number regardless of size was counted as one word. In Lorge's[1] study, compound words in place names or person's names were considered as one word, e.g.;New York, United States, van Loon. Because the study reported here necessitated the counting of a large number of geographic names many of which were compound words of varying number of parts, the writer counted each word in a compound word as a separate word, e.g.; "Strait of Juan de Fuca" counted as five words.

To minimize any error which might occur in establishing the limits of the standard unit of a sampled page, the

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[1] Irving Lorge, "Predicting Readability," Teacher's College Record, XLV (March,1944), 404-19.

writer counted twice the words in each unit. In each case, considerable time had elapsed between the first count and the re-count.

The Criteria for Judging Facts. The next problem was to determine what was to be counted as a fact. According to a dictionary definition, a fact is "The statement of a thing done or existing."[1] This definition was interpreted by the writer to imply that only that statement or part of a statement, should be counted as a fact for which it seemed evident that proof could be obtained either from first-hand information, reliable statistics, or other reliable sources of information, e.g.; "The Gold Coast produces more cacao than any other part of the world."

In his study, Dolch[2] used as criteria in judging the number of facts, (1) the asking of the question, "What might a teacher ask in an examination?" and (2) the noting of those facts which would be needed for the complete answer according to the particular text being analyzed. To cite an example, he states:

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[1] Webster's Collegiate Dictionary. (Springfield: G. & C. Merriam Company, 1942.)p. 358.

[2] Edward W. Dolch, "Fact Burden and Reading Difficulty," The Elementary English Review, XVI (April, 1939), 135-38.

> For instance, if the textbook says that 'New York is on Manhattan Island,' there are obviously two geographic facts. The teacher might ask, 'Where is New York?' If the pupil answered, 'On an island,' he would have only one part of the answer, the other being that the island is named Manhattan.[1]

It appeared to the writer that Dolch's first criterion, if adhered to in the strictest sense, might involve the selection of certain facts and the exclusion of other facts. If a person considers each statement in the light of its examination possibilities, might some fact not qualify for inclusion because of its lesser importance when compared with other facts? Because it is the purpose of this study to count all facts included in the sampling of the textbook, it was important that the writer consider every statement of examination caliber, and mentally re-word it in the form of a question in order to note the number of facts required to give a complete answer.

The following criteria were used, therefore, by the writer in determining and counting facts for the purpose of measuring the fact burden of the textbooks used in this study: (1) To be considered a fact, a group of words must contain information based on actuality for which it would be possible to obtain proof, if necessary. (2) To be considered a fact, a

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[1] *Ibid.*, p. 135

statement must qualify as an essential factor in the complete answer to a question which might be formulated to cover a portion of the content material.

The Counting of Facts. Using the above criteria, the writer proceeded to determine the number of facts in the unit on each sampled page. The relative importance of each fact; the difficulty of the fact itself because of its relative strangeness or remoteness from the child's experience; or the number of times any one fact was repeated were not taken into consideration when measuring the fact burden by counting the number of facts. Each fact as it appeared was given the same weight as any other fact in the tabulation. Thus the writer counted eight facts in the following sentence: "By far the greatest flow of wheat from the prairies is eastward by train through Winnipeg and on to Fort William and Port Arthur on Lake Superior." One might ask, "To where does the greatest flow of wheat go?" and "How is it transported?" The writer felt that the following facts were included in the sentence from the text and were necessary in obtaining a complete answer to the above questions: (1) The greatest flow of wheat is from the prairies. (2) The flow is eastward. (3) The flow is by train. (4) The train goes through Winnipeg. (5) The train goes to Fort William. (6) The train goes to Port Arthur. (7) These cities are on a lake. (8) They are on Lake Superior.

"The corn is then dumped from the sacks," was counted as a fact as well as, "About five-sixths of the corn produced is exported." Both of these statements appeared in the same unit of sampling. No allowance was made for the fact that the latter statement is of greater importance than the former statement.

"In some cities of the Middle West, flour-milling is a very important industry," was analyzed for its fact content as were the following statements which appeared in the same unit: "Buffalo and Minneapolis are two leading flour-milling cities of the country," and "St. Louis and Kansas City also have large flour mills, and milling is the leading industry of many smaller cities." No allowance was made for the fact that the last two statements contained specific information which might be considered as included in the generality of the first statement quoted. Each fact in each statement was counted on an equal basis with every other fact.

In the statement, "Silver, lead, zinc, and other minerals are mined," "and other minerals" was counted as a fact having equal weight with "silver," "lead," "zinc." The statement that there were other minerals was considered an expression of an actual condition.

Statements which called upon the imagination or observation of the pupil, or in which the opinion of the author

of the textbook was recorded, were not analyzed for fact content. This included such statements as: "Try to imagine you are on an ocean liner steaming up the broad estuary to this great port." "You may have seen Ozark jams, jellies, and honey on your grocer's shelves." "Growing of forest trees for wood and of trees for fruit probably is the best use that can be made of the rougher land."

The Recording of the Data. The writer was well aware of the fact that analyzation of the type utilized in this study is subject to the errors or peculiarities of individual judgment. In an attempt to minimize the amount of error and to increase the reliability of the results, the following procedure was employed in this study: (1) Each unit of sampling was read and groups of words, which at the time appeared to contain facts, were copied. (2) At a later date each unit of sampling was re-read and groups of words were added to or deleted from the original list in cases where adjustment was necessary. (3) Each fact was then indicated by a check and the facts were counted. (4) Each list of groups of words were checked for interpretation of fact content and adjustments made if necessary. (5) The facts were then re-counted.

The Analyzing of the Data. Using the data derived from this study, the number of words in each unit of sampling and the

number of facts in each unit of sampling were tabulated, totaled, and an average for each was calculated. The average number of facts for each textbook sample was then considered to be the *fact burden* of the textbook and will be referred to as such in the interpretation of the data.

It was then possible to compare each book in a series with the other two books in the same series and to compare each book recommended for a certain grade with the other two books designated for the same grade.

CHAPTER IV

ANALYSIS OF THE DATA

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The data were analyzed to compare:

1. The fact burden of each geography textbook with each of two other textbooks which were in the same series but were for different grade levels.
2. The fact burden of each textbook with each of two other textbooks which were for the same grade level but were in different series.

In order to facilitate this analysis, the limits of the ten units of the sample from each of the nine textbooks used in this study were tabulated along with the number of words and the number of facts in each unit of sampling. Tables II-X show this tabulation.

TABLE II

NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE FIVE IN SERIES A

Sample	Number of words	Number of facts
P. 38 beginning with New England took to p. 39 ending with from the tanneries	600	88
P. 74 beginning with Through the blue to p. 75 ending with products are made	591	86
P.111 beginning with The Nashville Basin to p. 112 ending with the river beds	605	71
P.148 beginning with Twin ports on to p. 149 ending with the same time	604	64
P.185 beginning with Among the crops to p.186 ending with the Grand Canyon	608	74
P.222 beginning with When shipping lanes to p.223 ending with circle really is	586	50
P.259 beginning with By far the greatest to p.260 ending with tourists every summer	605	81
P.296 beginning with Dominican Republic to p.297 ending with of the country	598	80
P.333 beginning with Each year thousands to p.334 ending with of our hemisphere	594	69
P.369 beginning with slaves from Africa to p.368 ending with On the map	602	85

TABLE III

NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE SIX IN SERIES A

Sample	Number of words	Number of facts
P.37 beginning with Liverpool.Liverpool is to p.39 ending with in making margarine	602	76
P.74 beginning with Both natives and to p.75 ending with in northern Africa	592	84
P.112 beginning with The tropical north to p.113 ending with the Pacific Ocean	604	90
P.148 beginning with Now that you to p.149 ending with cities of France	609	85
P.185 beginning with The central coal to p.187 ending with left in ruins	605	95
P.222 beginning with The largest city to p.223 ending with the Elbe River	599	77
P.259 beginning with Wheat and corn to p.260 ending with in the cities	597	89
P.296 beginning with Foreword. The map to p.297 ending with and Bandar Shahpur	600	102
P.333 beginning with The tin deposits to p.334 ending with to world trade	601	89
P.370 beginning with You have already to p.270 ending with continent of Antarctica	599	80

TABLE IV

NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE SEVEN IN SERIES A

Sample	Number of words	Number of facts
P.37 beginning with *We all know* to p.38 ending with *St. Lawrence River*	597	90
P.74 beginning with *The early roads* to p.75 ending with *The Delaware River*	606	98
P.111 beginning with *The Great Lakes* to p.112 ending with *small open cars*	602	85
P.148 beginning with *The Middle Period* to p.149 ending with *suitable for agriculture*	605	65
P.185 beginning with *Our best South* to p.186 ending with *take the lead*	603	89
P.222 beginning with *Many of the* to p.223 ending with *a railroad there*	597	85
P.259 beginning with *The map on* to p.261 ending with *are less valuable*	600	89
P.296 beginning with *Coal and lignite* to p.297 ending with *of the farms*	591	106
P.333 beginning with *The map on* to p.334 ending with *Indians of Peru*	598	69
P.370 beginning with *Exports and imports* to p.372 ending with *the Malay Peninsula*	601	92

TABLE V

NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE FIVE IN SERIES B

Sample	Number of words	Number of facts
P.30 beginning with Harvest work was to p.30 ending with indigo, and cotton	592	79
P.60 beginning with The ore fleet to p.61 ending with coming of railroads	604	81
P.90 beginning with Improvements. Year by to p.91 ending with from the east	592	79
P.120 beginning with In a coal-mining to p.121 ending with of good coal	603	67
P.150 beginning with Many other workers to p.151 ending with coast of Texas	607	79
P.180 beginning with East and west to p.181 ending with labor-saving machinery	604	79
P.210 beginning with Wake Island is to p.211 ending with along the coast	599	63
P.240 beginning with Throughout the tierra to p.242 ending with strip of land	596	87
P.270 beginning with Wealth in a dry to p.270 ending with Lima is Callao	597	87
P.300 beginning with Sao Paulo. Rio to p.300 ending with a market village	609	81

TABLE VI

NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE SIX IN SERIES B

Sample	Number of words	Number of facts
P.23 beginning with trade its explain to p.22 ending with coal came after	601	70
P.50 beginning with Empire British the to p.49 ending with manufactures heavy 'The'	601	84
P.78 beginning with many other factories to p.80 ending with large public buildings	600	86
P.105 beginning with Poor farmland. to p.106 ending with on similar plans	602	80
P.130 beginning with Surface and climate to p.131 ending with manufacturer of metals	605	77
P.156 beginning with One of Poland's to p.157 ending with rich in history	596	83
P.179 beginning with centers manufacturing to p.178 ending with part this In	587	98
P.208 beginning with An April landscape to p.209 ending with are winter crops	600	72
P.234 beginning with In most places to p.234 ending with a cloudless sky	607	78
P.260 beginning with In the dry to p.260 ending with a trade center	603	83

TABLE VII

NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE SEVEN IN SERIES B

Sample	Number of words	Number of facts
P.28 beginning with For almost three to p.29 ending with retail business districts	592	99
P.56 beginning with Corn. Corn ranks to p.57 ending with of the Pampa	603	103
P.84 beginning with Bolivian mines. Following to p.84 ending with clearing the forest	602	89
P.113 beginning with Work on a to p.114 ending with is not cultivated	605	103
P.140 beginning with More basin views to p.141 ending with now been mined	600	96
P.168 beginning with Much mud is to p.169 ending with towed by oxen	598	79
P.196 beginning with In Barbary. It to p.197 ending with visited by tourists	601	112
P.230 beginning with Isolation and to p.231 ending with the great markets	604	98
P.245 beginning with only in spots to p.244 ending with An outer harbor	598	85
P.279 beginning with for its imports to p.279 ending with Much tin, however,	597	74

TABLE VIII

NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE FIVE IN SERIES C

Sample	Number of words	Number of facts
P.37 beginning with *The first people* to p.44 ending with *dark and frightening*	601	79
P.74 beginning with *Most of the* to p.75 ending with *trees on farms*	604	73
P.111 beginning with *Compare the cotton* to p.111 ending with *in other ways*	597	63
P.150 beginning with *Few regions in* to p.152 ending with *sell to visitors*	600	63
P.185 beginning with *Another use of* to p.186 ending with *within a few miles*	595	70
P.222 beginning with *You need a globe* to p.223 ending with *reach the city*	604	74
P.259 beginning with *Ottawa and the* to p.260 ending with *those in Pittsburgh*	601	69
P.296 beginning with *How are bananas* to p.297 ending with *in each berry*	601	69
P.333 beginning with *The map shows* to p.334 ending with *the United States*	598	78
P.370 beginning with *It does not* to p.372 ending with *city in Argentina*	605	75

TABLE IX

NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE SIX IN SERIES C

Sample	Number of words	Number of facts
P.35 beginning with In this book to p.36 ending with houses were common	604	54
P.70 beginning with Now find the to p.71 ending with of poor quality	594	88
P.105 beginning with describe it briefly to p.103 ending with We usually think	597	73
P.140 beginning with Farm products to p.142 ending with of the world	597	75
P.175 beginning with Both Italy and to p.176 ending with they turn golden	600	89
P.210 beginning with The most widely to p.211 ending with and other plants	602	70
P.245 beginning with There are many to p.246 ending with during the summer	598	88
P.280 beginning with Canton is to to p.281 ending with the Burma Road	604	110
P.314 beginning with has cotton mills to p.313 ending with It is built	609	91
P.350 beginning with The mining of to p.351 ending with living through industry	596	82

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TABLE X

NUMBER OF WORDS AND FACTS IN THE TEN SELECTED SAMPLES FROM THE TEXTBOOK FOR GRADE SEVEN IN SERIES C

Sample	Number of words	Number of facts
P.29 beginning with Our most valuable to p.31 ending with another thunderstorm occurs	595	90
P.54 beginning with The sweet potato to p.56 ending with dried for raisins	594	112
P.80 beginning with than the corn to p.78 ending with Then they dye	596	70
P.108 beginning with Paper. Paper is to p.109 ending with Southern pine trees	602	103
P.137 beginning with Our dependence upon to p.139 ending with continued to increase	604	102
P.162 beginning with Our largest natural to p.163 ending with Dam in California	603	94
P.189 beginning with machinery is used to p.187 ending with Cotton gins are	604	109
P.217 beginning with Importance of our to p.218 ending with Features, natural resources	599	81
P.243 beginning with Our dependence upon to p.244 ending with with Canadian asbestos	597	115
P.269 beginning with From the Philippines to p.267 ending with during the first ten	603	115

The data in the foregoing tables were then summarized by totaling the number of words and facts in each textbook sample and calculating the average number of words and facts for each. Tables XI-XIII summarize the data for each geography series.

TABLE XI

THE TOTAL AND AVERAGE NUMBER OF WORDS AND FACTS IN THE TEXTBOOK SAMPLES IN SERIES A

Textbook	Total no. of words	Average no. of words	Total no. of facts	Average no. of facts
A-5	5993	599.3	748	74.8
A-6	6008	600.8	867	86.7
A-7	6000	600.0	868	86.8

TABLE XII

THE TOTAL AND AVERAGE NUMBER OF WORDS AND FACTS IN THE TEXTBOOK SAMPLES IN SERIES B

Textbook	Total no. of words	Average no. of words	Total no. of facts	Average no. of facts
B-5	6003	600.3	782	78.2
B-6	6002	600.2	793	79.3
B-7	6000	600.0	938	93.8

TABLE XIII

THE TOTAL AND AVERAGE NUMBER OF WORDS AND FACTS IN THE TEXTBOOK SAMPLES IN SERIES C

Textbook	Total no. of words	Average no. of words	Total no. of facts	Average no. of facts
C-5	6006	600.6	710	71.0
C-6	6001	600.1	820	82.0
C-7	5997	599.7	991	99.1

Tables XIV-XVI summarize the data of textbooks for the same grade in the different series.

TABLE XIV

THE AVERAGE NUMBER OF WORDS AND FACTS IN THE TEXTBOOK SAMPLES FOR GRADE FIVE

Textbook	Average no. of words	Average no. of facts
A-5	599.3	74.8
B-5	600.3	78.2
C-5	600.6	71.0

TABLE XV

THE AVERAGE NUMBER OF WORDS AND FACTS IN THE TEXTBOOK SAMPLES FOR GRADE SIX

Textbook	Average no. of words	Average no. of facts
A-6	600.8	86.7
B-6	600.2	79.3
C-6	600.1	82.0

TABLE XVI

THE AVERAGE NUMBER OF WORDS AND FACTS IN THE TEXTBOOK SAMPLES FOR GRADE SEVEN

Textbook	Average no. of words	Average no. of facts
A-7	600.0	86.8
B-7	600.0	93.8
C-7	599.7	99.1

In comparing the data in the preceding tables by inspection, it is noted that within each series the average number of facts increases as the grade level increases. This increase varies from .1 facts in the comparison of A-6 and A-7 to 17.1 in the comparison of C-6 and C-7. In comparing the textbooks for the same grade level there appears to be no consistency in the results. For grade five, C-5 has the lowest average number of facts and B-5 the highest average number; for grade six, B-6 has the lowest average number of facts and A-6 the highest average numbers; for grade seven A-7 has the lowest average number of facts and C-7 the highest average number. Thus each series qualified for a lowest and a highest classification at one grade level or the other.

In order to determine statistically the significance of these differences, the critical ratio was calculated for the difference between the average or mean number of facts of each textbook sample with (1) each other textbook in the same series, and (2) each other textbook at the same grade level in the different series. Wert[1] says:

> The difference between two means will fluctuate in successive samples; and, consequently the difference of

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[1] James E. Wert, Educational Statistics. (New York: McGraw Hill Book Company, 1938), 145.

two means has a standard error of its own, called the *standard error of a difference between two means*. When the difference between these two means is divided by the standard error of that difference, a ratio is found which is sometimes called the *critical ratio*. Whenever this ratio is unity, the chances are 68 in 100 that the difference is too great to be the result of sampling fluctuations; whenever this ratio is two, the chances are 95 out of 100 that the difference is too great to be the result of sampling fluctuations; and, whenever the ratio is three or more, it is a practical certainty that the difference is too great to be the result of sampling fluctuations.

Tables XVII-XXXIV show the comparisons of the average or mean number of facts in the textbook samples. In these comparisons, the average number of facts for each textbook is considered to be the *fact burden* of the textbook.

TABLE XVII

COMPARISON OF FACT BURDEN OF TEXTBOOK A-5 WITH TEXTBOOK A-6

Text	Mean	S.D.	S.E.$_m$	Diff.$_m$	S.E.$_{diff.}$	C.R.
A-5	74.8	11.18	3.54	11.9	4.29	2.77
A-6	86.7	7.67	2.43			

A critical ratio of 2.77 shows that the difference between the means is not statistically significant. The chances are 99 in 100 that the difference between the mean number of facts in the textbooks compared is too great to be the result of sampling fluctuations and is a true difference.[1]

TABLE XVIII

COMPARISON OF FACT BURDEN OF TEXTBOOK A-5 WITH TEXTBOOK A-7

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
A-5	74.8	11.18	3.54	12.0	5.09	2.66
A-7	86.8	11.58	3.66			

A critical ratio of 2.66 signifies that the chances are 98 in 100 that the difference between the means in the above table is too great to be the result of sampling fluctuations.

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[1] C. W. Odell, An Introduction to Educational Statistics. (New York: Prentice-Hall, Inc., 1946), 259.

TABLE XIX

COMPARISON OF FACT BURDEN OF TEXTBOOK A-6 WITH TEXTBOOK A-7

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
A-6	86.7	7.67	2.43	.1	4.39	.02
A-7	86.8	11.58	3.66			

A critical ratio of .02 indicates that there is a very small chance that this difference between the mean number of facts in the textbooks for grade six and grade seven in the series under consideration is not the result of the fluctuations incurred during the sampling process.

TABLE XX

COMPARISON OF FACT BURDEN OF TEXTBOOK B-5 WITH TEXTBOOK B-6

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
B-5	78.2	7.28	2.30	1.1	3.35	.33
B-6	79.3	7.69	2.43			

A critical ratio of .33 is an indication that the chances are only 24 in 100 that the difference between the mean number of facts in the two textbooks compared is too great to be the result of sampling fluctuations.

TABLE XXI

COMPARISON OF FACT BURDEN OF TEXTBOOK B-5 WITH TEXTBOOK B-7

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
B-5	78.2	7.28	2.30	15.6	4.23	3.69
B-7	93.8	11.23	3.55			

A critical ratio of 3.69 is considered statistically significant indicating that there is a practical certainty that the difference between the mean number of facts in the two textbooks above is too great to be the result of sampling fluctuations and that this is a true difference.

TABLE XXII

COMPARISON OF FACT BURDEN OF TEXTBOOK B-6 WITH TEXTBOOK B-7

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
B-6	79.3	7.69	2.43	14.5	4.23	3.37
B-7	93.8	11.23	3.55			

A critical ratio of 3.69 reveals a difference between the means that is statistically significant.

TABLE XXIII

COMPARISON OF FACT BURDEN OF TEXTBOOK C-5 WITH TEXTBOOK C-6

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
C-5	71.0	5.48	1.73	11.0	4.85	2.27
C-6	82.0	14.30	4.53			

A critical ratio of 2.27 is an indication that the chances are 98 in 100 that the difference between the means in the above comparison is too great to be the result of sampling fluctuations.

TABLE XXIV

COMPARISON OF FACT BURDEN OF TEXTBOOK C-5 WITH TEXTBOOK C-7

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
C-5	71.0	5.48	1.73	28.1	4.88	5.76
C-7	99.1	14.41	4.56			

A critical ratio of 5.76 denotes a difference between the means that is statistically significant.

TABLE XXV

COMPARISON OF FACT BURDEN OF TEXTBOOK C-6 WITH TEXTBOOK C-7

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
C-6	82.0	14.30	4.53	17.1	6.43	2.66
C-7	99.1	14.41	4.56			

A critical ratio of 2.66 signifies that the chances are 99 in 100 that the differences between the mean number of facts in the textbooks compared above is too great to be the result of sampling fluctuations.

TABLE XXVI

COMPARISON OF FACT BURDEN OF TEXTBOOK A-5 WITH TEXTBOOK B-5

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
A-5	74.8	11.18	3.54	3.4	4.22	.81
B-5	78.2	7.28	2.30			

The chances are 58 in 100 that the difference between the means in the above comparison, as revealed by a critical ratio of .81, is too great to be the result of sampling fluctuations.

TABLE XXVII

COMPARISON OF FACT BURDEN OF TEXTBOOK A-5 WITH TEXTBOOK C-5

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
A-5	74.8	11.18	3.54	3.8	3.94	.96
C-5	71.	5.48	1.73			

A critical ratio of .96 signifies that there are 68 chances in 100 that the difference between the mean number of facts in the textbooks compared above is too great to be the result of sampling fluctuations.

TABLE XXVIII

COMPARISON OF FACT BURDEN OF TEXTBOOK B-5 WITH TEXTBOOK C-5

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
B-5	78.2	7.28	2.30	7.2	2.88	2.50
C-5	71.0	5.48	1.73			

A critical ratio of 2.50 indicates that there are 99 chances in 100 that the difference between the two means above is too great to be the result of sampling fluctuations.

TABLE XXIX

COMPARISON OF FACT BURDEN OF TEXTBOOK A-6 WITH TEXTBOOK B-6

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
A-6	86.7	7.67	2.43	7.4	3.44	2.15
B-6	79.3	7.69	2.43			

The chances are 97 in 100 that the difference between the mean number of facts in the above comparison is too great to be the result of sampling fluctuations as revealed by a critical ratio of 2.15.

TABLE XXX

COMPARISON OF FACT BURDEN OF TEXTBOOK A-6 WITH TEXTBOOK C-6

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
A-6	86.7	7.67	2.43	4.7	5.14	.91
C-6	82.0	14.30	4.53			

A critical ratio of .91 signifies that there are only 63 chances in 100 that the difference between the mean number of facts in the textbooks compared above is great enough not to be the result of sampling fluctuations.

TABLE XXXI

COMPARISON OF FACT BURDEN OF TEXTBOOK B-6 WITH TEXTBOOK C-6

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
B-6	79.3	7.69	2.43	2.7	5.14	.53
C-6	82.0	14.30	4.53			

A critical ratio of .53 is indicative that the chances are only 38 in 100 that the difference in the means above is too great to be the result of variance incurred by the sampling technique.

TABLE XXXII

COMPARISON OF FACT BURDEN OF TEXTBOOK A-7 WITH TEXTBOOK B-7

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
A-7	86.8	11.58	3.66	7.0	5.10	1.37
B-7	93.8	11.23	3.55			

There are 84 chances in 100, as revealed by a critical ratio of 1.37, that the difference between the means in this comparison of textbooks is too great to be the result of sampling fluctuations.

TABLE XXXIII

COMPARISON OF FACT BURDEN OF TEXTBOOK A-7 WITH TEXTBOOK C-7

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
A-7	86.8	11.58	3.66	12.3	5.85	2.10
C-7	99.1	14.41	4.56			

A critical ratio of 2.10 signifies that there are 96 chances in 100 that the difference between the mean number of facts in the textbooks compared above is too great to be the result of variation due to the employment of the sampling technique.

TABLE XXXIV

COMPARISON OF FACT BURDEN OF TEXTBOOK B-7 WITH TEXTBOOK C-7

Text	Mean	S.D.	S.E. m	Diff. m	S.E. diff.m	C.R.
B-7	93.8	11.23	3.55	5.3	5.77	.92
C-7	99.1	14.41	4.56			

A critical ratio of .92 is an indication that the chances are only 63 in 100 that the difference between the mean number of facts in the two textbooks compared is too great to be the result of sampling fluctuations.

CHAPTER V

SUMMARY AND CONCLUSIONS

SUGGESTIONS FOR FURTHER STUDY

CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of this study was to measure the fact burden of certain geography textbooks in order to determine (1) if there is any characteristic difference of fact burden between texts for different grades in the same series, and (2) if there is any characteristic fact burden for any grade level. Three series of textbooks commonly used in grades five, six, and seven or eight were sampled for their fact content.

The conclusions obtained from the data were:

1. The difference between the fact burden of each book in Series A with each other book in the same series was not statistically significant.
2. The difference between the fact burden in the textbooks in Series B was not statistically significant when comparing the book for grade five with the book for grade six; but was statistically significant when comparing the book for grade five with the book for grade seven and when comparing the book for grade six with the book for grade seven.

3. The difference between the fact burden in the textbooks in Series C was statistically significant only when comparing the book for grade five with the book for grade seven.
4. The difference between the fact burden of each book for grade five with each other book for grade five was not statistically significant.
5. The difference between the fact burden of each book for grade six with each other book for grade six was not statistically significant.
6. The difference between the fact burden of each book for grade seven with each other book for grade seven was not statistically significant.

It was not the purpose of this study to rate the textbooks, on the basis of their fact burden, with respect to their desirability for use in the grades for which they are intended. Sufficient research has not been perpetrated to give a basis for stating that one book is preferable to another because of its heavy or light fact burden. One cannot help but note, however, the great number of facts per page in the textbook samples used in this study. Taking into account all units of sampling in the nine textbooks examined, there

is an over-all average of 83.4 facts per page and on eleven pages, there are over 100 facts. Because in only an occasional instance is a fact on any page of any textbook used in this study set apart from the other facts as being an important one to remember, the burden of discriminating between facts that are fundamental and those that are incidental is put entirely upon the individual teacher. Which of these many facts are essential and useful to individuals as members of society? Whichever facts fall into this category are the facts which the teacher should emphasize and check to ascertain if they are understood by the pupils. Therefore it is important that the teacher use thoughtful and careful consideration in the selection of those facts to stand out like headlines for the pupils' attention. Because the pupils are exposed to a multiplicity of facts in their independent geographical reading, it further emphasizes the importance of guiding pupils to evaluate major and minor facts, and to understand the relationships among the various elements of the factual geographic background.

SUGGESTIONS FOR FURTHER STUDY

1. A comparative analysis of the fact burden of textbooks for the other content subjects in the curriculum for the grades under consideration in this study.
2. A study to determine to what extent teachers agree as to which facts should be emphasized on any given page of geographic material.
3. A study to determine to what extent pupils agree as to which facts are the most important to be remembered on any given page of geographic material.
4. A comparative analysis of the facts selected by teachers as important with those selected by pupils.
5. A study to determine the number of facts on any given page of geographic material retained by pupils of the grade within this study after independent reading by the pupils of said material.
6. A comparative analysis of the facts selected as most important by teachers or pupils in certain geographic material with those facts

retained by pupils after independent reading of the same material.

7. A study to determine whether important facts are retained to a greater extent if they are set apart from enrichment material by a different type of print or by underlining than if they are not indicated in any way.
8. A study to determine to what extent pupils in different grades differ in the type of facts retained after independent reading of certain geographic material--facts relating to certain elements of the natural aspect or facts relating to certain elements of the cultural aspect.

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